

WHAT IS CLAIMED IS:

1           1.     A method for maintaining a database of data objects, comprising:  
2           receiving a first data object implemented in a first programming language  
3           including attributes and attribute values for a class;  
4           transforming the first data object to a second data object implemented in a second  
5           programming language, wherein the second data object includes the attributes and  
6           attribute values of the class included in the first data object; and  
7           adding the second data object to the database, wherein the database is capable of  
8           storing multiple data objects implemented in the second programming language.

1           2.     The method of claim 1, further comprising:  
2           receiving a class schema including information on the class and attributes of the  
3           first data object; and  
4           using the received class schema to transform the first data object to the second  
5           data object.

1           3.     The method of claim 2, wherein using the received class schema to  
2           transform the first data object to the second data object further comprises:  
3           generating a source code file in the second programming language to implement  
4           the class and attributes included in the class schema;  
5           compiling the source code file to generate an executable file that implements  
6           methods of the class;  
7           using one method of the class to construct the second data object; and  
8           including the attribute values from the first data object into the second data object.

1           4.     The method of claim 3, wherein generating the source code file in the  
2           second programming language further comprises:  
3           generating statements into the source code file to define SET and GET interfaces  
4           for each attribute in the class.

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1           5.       The method of claim 4, wherein including the attribute values from the  
2 first data object into the second data object further comprises:  
3           using at least one GET method in the first programming language to access the  
4 attribute values from the first data object; and  
5           using at least one SET method in the second programming language to set each  
6 attribute in the second data object to the corresponding accessed attribute value.

1           6.       The method of claim 4, wherein including the attribute values from the  
2 first data object into the second data object further comprises:  
3           using at least one GET method in the first programming language to access the  
4 attribute values from the first data object; and  
5           generating statements into the source code file to set the attributes in the second  
6 data object to the accessed attribute values from the first data object, wherein compiling  
7 the source code file produces the second data object with the attribute values set to the  
8 attribute values accessed from the first data object.

1           7.       The method of claim 2, wherein the class schema includes for each  
2 attribute a name, data type and length of the attribute.

1           8.       The method of claim 2, wherein the class schema is implemented in an  
2 Extensible Markup Language (XML) file.

1           9.       The method of claim 1, wherein the database comprises an object oriented  
2 database.

1           10.      The method of claim 1, wherein the first programming language  
2 comprises a non-Java object oriented language and wherein the second programming  
3 language comprises the Java programming language.

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1        11.    The method of claim 1, further comprising:  
2        receiving a third data object implemented in the second programming language;  
3        and  
4        adding the third data object to the database.

1        12.    The method of claim 1, further comprising:  
2        receiving a third data object implemented in a third programming language  
3        including attributes and attribute values for one class;  
4        transforming the third data object to a fourth data object implemented in the  
5        second programming language, wherein the fourth data object includes the attributes and  
6        attribute values of the class included in the third data object; and  
7        adding the fourth data object to the database.

1        13.    A method for returning data objects from a database to an application that  
2        processes data objects in a first programming language, comprising:  
3        receiving a request from the application for at least one data object in the database  
4        having attributes and attribute values of a class;  
5        accessing each requested data object from the database, wherein data objects in  
6        the database are implemented in a second programming language;  
7        transforming each accessed data object to one transformed data object  
8        implemented in the first programming language, wherein each transformed data object  
9        includes the attributes and attribute values of the class in each accessed data object; and  
10        returning each transformed data object in the first programming language to the  
11        application that initiated the request.

1        14.    The method of claim 13, wherein transforming each accessed data object  
2        to one transformed data object further comprises for each requested data object:  
3        using a GET interface in the second programming language to access the attribute  
4        values in the accessed data object; and

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5 using a SET interface in the first programming language to add each accessed  
6 attribute value from the accessed data object to the transformed data object.

1 15. The method of claim 13, wherein the application that processes data  
2 objects in the first programming language comprises a first application, further  
3 comprising:  
4 receiving a request for at least one data object in the database from a second  
5 application that processes data objects in the second programming language;  
6 accessing each requested data object from the database; and  
7 returning each data object accessed from the database in response to the request  
8 from the second application to the second application.

1 16. The method of claim 13, further comprising:  
2 providing at least one class schema, wherein each class schema includes  
3 information on one class and attributes of the class of at least one data object in the  
4 database, wherein transforming each accessed data object to one transformed data object  
5 further comprises, for each accessed data object, using information on the attributes in  
6 the class schema for the class of the accessed data object to transform the accessed data  
7 object to the transformed data object.

1 17. The method of claim 16, wherein each class schema includes a length of  
2 each attribute in the class, and wherein using the information on the attributes in the class  
3 schema to transform each accessed data object to one transformed data object further  
4 comprises:  
5 accessing information on the length for each attribute in the class schema to  
6 generate the transformed data object to have a size at least equal to the lengths of all of  
7 the attributes in the class.

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1           18.     The method of claim 13, wherein the application requesting the at least  
2     one data object is capable of processing data objects in one of the first programming  
3     language or a third programming language, further comprising:  
4           determining whether the application requesting the at least one data object  
5     processes data objects in the first programming language or the third programming  
6     language, wherein the step of transforming each accessed data object to the first  
7     programming language occurs if the application requesting the at least one data object  
8     processes data objects in the first programming language;  
9           transforming each accessed data object to one transformed data object  
10    implemented in the third programming language if the application requesting the at least  
11    one data object processes data objects in the third programming language; and  
12           returning each transformed data object in the third programming language to the  
13    application that initiated the request.

1           19.     A method for providing information on a class, comprising:  
2           receiving a definition of a class and attributes in the class;  
3           generating a file; and  
4           adding information on the class and each attribute in the received class definition  
5    to the generated file.

1           20.     The method of claim 19, wherein adding information on each attribute to  
2    the generated file further comprises:  
3           adding information on a name, length and data type of each attribute in the class  
4    in the received class definition to the generated file.

1           21.     The method of claim 19, further comprising:  
2           generating at least one tagged element into the file including information on each  
3    attribute in the class.

25. A system for maintaining a database of data objects, comprising:  
a computer readable medium including the database of data objects;  
means for receiving a first data object implemented in a first programming language including attributes and attribute values for a class;  
means for transforming the first data object to a second data object implemented in a second programming language, wherein the second data object includes the attributes and attribute values of the class included in the first data object; and  
means for adding the second data object to the database, wherein the database stores data objects implemented in the second programming language.

1           30.     A system for managing database requests from an application that  
2 processes data objects in a first programming language, comprising:  
3           a computer readable medium including a database having data objects  
4 implemented in a second programming language;  
5           means for receiving a request from the application for at least one data object in  
6 the database having attributes and attribute values of a class;

1           33.     The system of claim 30, further comprising:  
2           means for providing at least one class schema, wherein each class schema  
3 includes information on one class and attributes of the class of at least one data object in  
4 the database, wherein the means for transforming each accessed data object to one  
5 transformed data object further performs, for each accessed data object, using



6 information on the attributes in the class schema for the class of the accessed data object  
7 to transform the accessed data object to the transformed data object.

1 34. The system of claim 30, wherein the application requesting the at least one  
2 data object processes data objects in one of the first programming language or a third  
3 programming language, further comprising:  
4 means for determining whether the application requesting the at least one data  
5 object processes data objects in the first programming language or the third programming  
6 language, wherein the accessed data object is transformed to the first programming  
7 language if the application requesting the at least one data object processes data objects  
8 in the first programming language;  
9 means for transforming each accessed data object to one transformed data object  
10 implemented in the third programming language if the application requesting the at least  
11 one data object processes data objects in the third programming language; and  
12 means for returning each transformed data object in the third programming  
13 language to the application that initiated the request.

1 35. A system for providing information on a class, comprising:  
2 a computer readable medium;  
3 means for receiving a definition of a class and attributes in the class;  
4 means for generating a file in the computer readable medium; and  
5 means for adding information on the class and each attribute in the received class  
6 definition to the generated file.

1 36. The system of claim 35, wherein the means for adding information on  
2 each attribute to the generated file further performs:  
3 adding information on a name, length and data type of each attribute in the class  
4 in the received class definition to the generated file.

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Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100																																																																																																																																																																																																
Population (millions)	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	31.0	31.1	31.2	31.3	31.4

1           46.       The article of manufacture of claim 37, wherein the first programming  
2 language comprises a non-Java object oriented language and wherein the second  
3 programming language comprises the Java programming language.

1        47.    The article of manufacture of claim 37, further comprising:  
2        receiving a third data object implemented in the second programming language;  
3        and  
4        adding the third data object to the database.

1        48.    The article of manufacture of claim 37, further comprising:  
2        receiving a third data object implemented in a third programming language  
3        including attributes and attribute values for one class;  
4        transforming the third data object to a fourth data object implemented in the  
5        second programming language, wherein the fourth data object includes the attributes and  
6        attribute values of the class included in the third data object; and  
7        adding the fourth data object to the database.

1        49.    An article of manufacture including code for returning data objects from a  
2        database to an application that processes data objects in a first programming language,  
3        wherein the code causes operations to be performed comprising:  
4        receiving a request from the application for at least one data object in the database  
5        having attributes and attribute values of a class;  
6        accessing each requested data object from the database, wherein data objects in  
7        the database are implemented in a second programming language;  
8        transforming each accessed data object to one transformed data object  
9        implemented in the first programming language, wherein each transformed data object  
10       includes the attributes and attribute values of the class in each accessed data object; and  
11       returning each transformed data object in the first programming language to the  
12       application that initiated the request.

1        50.    The article of manufacture of claim 49, wherein transforming each  
2        accessed data object to one transformed data object further comprises for each requested  
3        data object:

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52. The article of manufacture of claim 49, further comprising:  
providing at least one class schema, wherein each class schema includes  
information on one class and attributes of the class of at least one data object in the  
database, wherein transforming each accessed data object to one transformed data object  
further comprises, for each accessed data object, using information on the attributes in  
the class schema for the class of the accessed data object to transform the accessed data  
object to the transformed data object.

1           53.     The article of manufacture of claim 52, wherein each class schema  
2 includes a length of each attribute in the class, and wherein using the information on the  
3 attributes in the class schema to transform each accessed data object to one transformed  
4 data object further comprises:  
5           accessing information on the length for each attribute in the class schema to  
6 generate the transformed data object to have a size at least equal to the lengths of all of  
7 the attributes in the class.

1           54.     The article of manufacture of claim 49, wherein the application requesting  
2     the at least one data object is capable of processing data objects in one of the first  
3     programming language or a third programming language, further comprising:  
4           determining whether the application requesting the at least one data object  
5     processes data objects in the first programming language or the third programming  
6     language, wherein the step of transforming each accessed data object to the first  
7     programming language occurs if the application requesting the at least one data object  
8     processes data objects in the first programming language;  
9           transforming each accessed data object to one transformed data object  
10    implemented in the third programming language if the application requesting the at least  
11    one data object processes data objects in the third programming language; and  
12           returning each transformed data object in the third programming language to the  
13    application that initiated the request.

1           55.     An article of manufacture including code for providing information on a  
2     class, wherein the code causes operations to be performed comprising:  
3           receiving a definition of a class and attributes in the class;  
4           generating a file; and  
5           adding information on the class and each attribute in the received class definition  
6     to the generated file.

1           56.     The article of manufacture of claim 55, wherein adding information on  
2     each attribute to the generated file further comprises:  
3           adding information on a name, length and data type of each attribute in the class  
4     in the received class definition to the generated file.

1           57.     The article of manufacture of claim 55, further comprising:  
2           generating at least one tagged element into the file including information on each  
3     attribute in the class.

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1           58.     The article of manufacture of claim 57, wherein generating the at least one  
2     tagged element into the file for each attribute in the class further comprises for each  
3     attribute of the class:

4                 generating one tagged element into the file including information on a name of  
5     the attribute;

6                 generating one tagged element into the file including information on a length of  
7     the attribute; and

8                 generating one tagged element into the file including information on a data type  
9     of the attribute.

1           59.     The article of manufacture of claim 57, wherein the generated file  
2     comprises an Extensible Markup Language (XML) file.

1           60.     The article of manufacture of claim 55, further comprising:  
2                 accessing the definition of the class, including information on attributes of the  
3     class, from a source code file of the class.

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